ANDE—Advanced Nondestructive Evaluation System

Los Alamos National Laboratory and
Nick Electronics

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ANDE is a detector system that uses ultrasonic interferometry and resonance to identify the contents of sealed containers, either through direct contact or from a distance of up to 15 feet. ANDE consists of a sound projector, a laser vibrometer, and an electronics package containing a computer, database, and transducer system. Other features of the system are that it

- ***identifies contents of sealed containers in less than 30 seconds;***
- ***measures physical properties of contents;***
- ***operates in hazardous environments;***
- ***adapts for characterization of single-drop samples;***
- ***can be used with sensitive materials such as high explosives; and***
- ***allows continuous monitoring.***

The ANDE standoff component is shown in operation. A directed sound beam, originating from the array (inset), interrogates one of the containers in the background. The array transmits a high-frequency wave converted to a low-frequency beam, which is localized near the container. The localized, low sound induces structural vibrations within the container. The vibrations (resonance spectrum) are detected with the laser vibrometer and are analyzed by the hand-held signal-processing unit. The analysis yields physical properties—such as sound speed, sound attenuation, density, and viscosity—which, when compared with an extensive database, uniquely identify the contents of the container.

Applications

ANDE's primary application is in the area of national security. It can also be used for law enforcement and environmental monitoring and is easily adapted for industrial and medical applications. The system can

- identify all common chemical warfare agents in munitions and storage containers;
- identify hazardous chemicals in unlabeled containers;
- identify illicit materials stored inside legal materials;
- accurately determine liquid levels, even in thick-walled tanks;
- monitor water quality inside tanks and pipes;
- detect wall corrosion inside sealed containers;
- determine physical properties of chemicals (e.g., process control in chemical industry);
- detect contamination and spoilage of foods inside bottles and cans;
- monitor downhole fluid (oil, brine, etc.) for the petroleum industry; and
- test single-drop pathological and biological samples.

Benefits

ANDE can save lives and property by

- safely identifying real threats, such as chemical warfare agents and other highly toxic chemicals before people and the environment are jeopardized; and
- preventing public concern by quickly exposing false threats before they attract attention.

Availability of applications for commercial licensing

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